

Homestead Agroforestry

Concept and definition

Homestead are one of the elaborate system of indigenous Agroforestry, mostly found in tropical and subtropical areas where subsistence land use system predominant.

It can be defined *"as the land surroundings a house on which a mixture of annual and perennial plants are grown together with/without animals largely managed by the household members for their own used for commercial purposes"*.

According to Fernandez and Nair, *"the term homestead Agroforestry means anything for growing vegetables behind house to complex multistoried system"*. They defined it as a land use practices involving deliberate management of multipurpose trees and shrubs in the intimate association with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses and the whole crop, tree, animal unit are being intensively managed by family labour.

A homestead is a unique combination of trees, shrubs, vegetables, livestock, animals, fish ponds and human beings functioning as an ecosystem and maintaining the diversity of the life as well as the biological wealth. So a rich homestead production system with plantation and other production enterprises provide immediate cash benefits as well as long term benefits for the farm families and thereby for the rural communities.

Characteristics of homestead

Homestead is fundamental to peasants live because they are not only units of production but are also part of the habitation unit of peasant family. Although there are many variations in homestead design and pattern depending on the region. A homestead usually contains a house, bare space and a cultivated in space. The homesteads are generally rectangular in shape and it is situated comparatively on a raised area. The extra earth for raising mounds is usually obtained by digging pond in a suitable place within a homestead which is usually fenced by trees or shrubs. An ideal homestead has a yard for threshing ground and commercial activities, cattle shed, ponds, trees, shrubs and bamboo, vegetables etc considering the size of homestead of different regions of Bangladesh, it could be categorised into 4 groups-

- Marginal homestead (>0.02–0.08 ha).
- Medium homestead (0.14–0.20 ha).
- Small homestead (0.08–0.14 ha).
- Large homestead (> 0.20 ha).

Constraints and problems of homestead Agroforestry

1. Lack of good seedlings/saplings.
2. Scarcity of space for planting of new trees in the homestead.
3. Lack of technical knowledge regarding proper management practice for growing trees and seedlings.
4. Homestead vegetation damaged by free grazing of neighbour's livestock, by the children and storms.
5. Lack of money and high price of sapling and quality seeds were the other constraints faced by the small farmers.
6. Besides all of these, attack of pest and disease, shortage of labour, natural disaster were also limiting the productivity of homestead.

Structure of homestead Agroforestry in Bangladesh

Structure of homestead in Bangladesh can be described as **horizontally** and **vertically**.

► Horizontally structure

On the basis of planting locations with in the home garden, species can be divided into three categories.

- Species for border only.
- Species for the interior only.
- Species for both border and the interior.

Most of the farmers of Bangladesh plant all timber trees and selected tall fruit such as Jam, Coconut, Tentul etc. in the border of the homestead; Bel, Pomegranate, Papaya, Citrus are planted only in the interior part of the homestead and some species are planted both in border and interior parts of the homesteads. The central area of the homestead accommodates yards, cattle and poultry shed, ponds and the vegetable Gardens and other small, pure stands of annual crops. Food and fruit producing species dominate the part of the homestead near the living quarters. Here fruit are safety from theft. To avoid damage to the living quarters during pruning and final felling, the farmers prefers remote parts of their home Gardens for growing large species for timber.

► Vertical structure

The vertical structure of the home garden overtime is not a static condition. It is perpetually changing and being renewed by the interplay of floristic and structural factors. It can therefore, termed as dynamic. The home garden have a multistoried canopy configuration. Basher (1999) identified 4 vertical canopy Strata and Mustafa (1997) identified 6 vertical canopy Strata.

Table: Vertical stratification of homestead Agroforestry in Bangladesh

| Stratum | Plant height | Example |
|---------|--------------|---|
| 1 | With in 1 m | Saplings, vegetables, tuber crops, grasses, shade loving and tolerant plants. |
| 2 | 2–5 m | Banana, papaya, Guava, young coconut etc. |
| 3 | 5–10 m | Mango, jackfruit, jujube, date palm, litchi, drumsticks etc. |
| 4 | > 10 m | Palmyra palm, coconut, betelnut, forest spp. |

| Stratum | Plant height | Example |
|---------|--------------|---|
| S0 | < 1 m | Turmeric, Ginger, pineapple as well as seedlings of Woody perennials. |
| S1 | 1–3 m | * Banana, papaya, many shrubs e.g. citrus, tea, coffee etc. * large seedlings of various trees. |
| S2 | 3–5 m | * Larger individual of Banana and papaya, * matures of some food and fruit trees and * Saplings of some timber species. |
| S3 | 5–7 m | Most productive individuals of food and fruit producing species. |
| S4 | 7–9 m | Almost all mature individuals of timber species and those of some of the fruit producing spp. belongs to this stratum. |
| S5 | > 10 m | Bamboos and trees of relatively tall homestead species such as coconut, khoir etc. all with fully exposed crowns. |

Management of homestead Agroforestry

The management of trees in homestead Agroforestry system is very important to maximize production and to accommodate more plant population. From the point of raising the seedlings up to the level of final harvest, appropriate Technology should be followed for better utilisation of land and for more production from the trees and their associates. Through adequate shoot and root pruning, the number of trees per unit

area can be increased considerably and thus vegetables and spices can be grown their successfully. Severe pruning generally reduced the food production of many trees. The management technology including pruning, multi graftage, renovation and multi layered production system should be practiced for fruit plants to get optimum production. The compatibility between the fruit trees and other annual crops should also be determined for higher productivity of the crops growing nearby or under the fruit trees.

Trees grown in the homestead

Farmers usually prefer multipurpose trees which supply fruit, fodder, fuelwood and timber to meet their day to day requirement, as well as sale to generate cash as a regular source of income and also to tide over emergent needs. Homestead Agroforestry is mainly silvo-horticultural and silvo-pastoral system where major agricultural crops are very rare.

The predominant trees planted in homestead are universally mango and Jackfruit which are used for fruit as well as for timber; the later species is also highly valued for forage, particularly goat farming. In the southern coastal districts, coconut and betel nut are predominant species for homestead Agroforestry and families count on their major income from the fruits of this two species. Major timber and fuelwood trees includes koroj, Raintree, Mander, simul, Jarul, mahogoni and other species. These are often in interspersed with other species viz. Date palm, Palmyra palm, Bamboo, Cane etc.

Vegetables grown in the homestead

Different types of vegetable and spices were found to grow in the homestead by all categories of farmer round the year in a small scale, but largely for own consumption. Vegetables were grown in three types of micro sites within the homestead viz. *In shady place, in open place and creeping on the tree*. Generally following types of vegetables are found in the homestead of Bangladesh.

| Types of vegetables | Name of the vegetables | Associated tree species |
|---------------------|---|---|
| Grow in open place | Country bean, lalshak, datashak, Indian spinach, snake gourd, ridge gourd, bottle gourd, spinach etc. | |
| Grow under shade | Lady's finger, kangkong, datashak, Indian spinach etc. | Mango, jujube, Jackfruit, Guava, drumstick, <i>Acacia</i> spp, coconut etc. |
| Tree creepers | Country bean, yam, kakrol, sponge gourd etc. | Drumsticks, mander, mango, jujube, Guava etc. |

Principles of Homestead planning

- To ensure light and aeration in homestead and its surrounding large tree like mango, Jackfruit, kamranga, coconut, betel nut etc should be planted at the north and western part of homestead. Timber and fuel yielding plants like Mahogany, sissoo, Raintree, bamboo, eucalyptus etc may also be grown in these parts.
- Quick growing fruit plants like banana, papaya, lemon, pineapple, jujubee etc. Should be planted North-East and south-west side of the homestead.
- Ornamental trees; e.g. Tejpata, daruchini, sapota, golapjam, pomegranate etc should be grown at the front side of the house.
- Small tree having short structure; e.g. Ata, Sharifa, Tejpata, daruchini etc may be grown partial shade also.
- South and Eastern side of a homestead are best for vegetable cultivation. This part may be used for seasonal vegetable production in rotation.
- Sweet gourd, white gourd, bottle gourd, snake gourd, bitter gourd etc. vine type herbs maybe grown in permanent scaffold under which duck and poultry may also be raised.
- Climbing type vegetables like yam, dhundhal, country bean, ridge gourd, pan, black pepper etc. may be grown on the roof or in association with common trees.
- Turmeric, Ginger etc. may be grown as under storied crops in shade.
- The boundary of a homestead should be fenced with khejur, bakphul, betel nut, sajna, Raintree, jigha, babla etc. which simultaneously provide vegetables as well as fuel wood.
- Each homestead, if possible should have an integrated approach of raising cattle, poultry and fish culture. For the purpose of provision of a pond having 25×20×6' size should be kept in a suitable place of a homestead. At the edge of pond, growing of ipil-ipil, Gliricidia will provide a carp fish (Telapia, nilotica, grass carp, silver carp etc).
- All the four bank of the pond may be used for growing coconut, betel nut, date palm, papaya etc. which increase the natural heats as well as keep the pond water cold during hot summer season through partial shade.
- At one corner of a homestead there should be a heap to make compost by using coddung, poultry litter, kitchen waste etc.

- If possible, there should have a family nursery in the homestead to get seedlings of trees and fruits in order to make it more productive.

Benefits from homestead Agroforestry

The homestead benefited its owner as well as the whole country in different ways viz.

1. By providing foods and feeds.
2. By increasing the productivity of soil.
3. By improving the environment.
4. By creating employment opportunities and generating cash income.
5. By supplying wood products.
6. Helps in maintaining savings and security.
7. Provide help for risk management.
8. Meet up the aesthetic needs.

Foods, fuel and timber

- Almost all of the total requirement of fruits and vegetables are produced in the homestead, home yard and marginal lands attached to the homestead.
- It provides bio-energy through direct conversion (firewood), pyrolytic conversion (charcoal, oil, gas etc.) as well as manufacturing ethanol from fruits. At present, the homestead are supplying 80% of the total Biomass, 65-70% of the total timber requirement and 90% of the fuel wood and bamboo consumed in the country.
- With the intensification of the cultivation, the grazing areas are decreasing day by day and the homestead is providing big share of livestock fodder.

Soil productivity

The vegetation of homestead supply nutrients to the soil and recycle it through:

- Adding organic matter in the form of litter fall, symbiotic nitrogen fixation, root biomass, mycorrhizal association.
- It increases the water holding capacity of the soil and regulates water runoff.
- It improves soil properties like soil texture and structure.

Improving the environment

- The homestead vegetation absorbs carbon dioxide and greenhouse gas like CFC and thus control air pollution and global warming.
- Maintaining atmospheric balance through:
 - Keeping the air cool especially in the tropics (reduce average maximum temperature by 4-5°C and increase average minimum temperature by 1.5-2°C).
 - Increasing rainfall.
 - Prevent natural disaster.
 - Controlling sound pollution.

Economic potential of homestead Agroforestry

Considering the physical and socio-economic view points, homestead of Bangladesh are more reliable and dependable property than that of crop fields as it is an important sources of income for the farmers. This is evident from the fact that the farmers sell crop land fight against pauperization, but retain the homestead unless absolutely unavoidable. Functionally, the landless farmers have even their own homestead where they grow the essential commodities for subsistence. Some of the working farm families after their own consumption of fruits, vegetables and spices, meet the family expenses ranges from 26-27% of the total family expenses by selling the homestead products. For this reality, during the last few decades, the relative importance has shifted from traditional forestry to homestead based system. That is why the homestead are now in position to provide 80% of the total requirement of timber, fuelwood and bamboo in the country. For this reason, the homestead are gradually increased and the rate of annual increment is 5 m³ per ha, which is more than double than that of government forests.

Planning of a homestead having 1 Bigha (15000 sq. ft.) Area

The following table shows the arrangement of flowering, fruit bearing, Timber plants, bamboo, quick growing trees, aquaculture and Agriculture through a 3 layered cropping system in a one bigha homestead. A tentative design has been given in below-

| Model garden | Area (sq. ft.) | Selected species | No. of species | Total no |
|----------------------------------|------------------------|---|---------------------------------------|----------|
| Coconut garden | 1560 (15×15); (5×5) | Coconut, papaya | 7, 63 | 7, 63 |
| Road side garden | 140 | Betel nut | 50 | 50 |
| Vegetable garden | 1695 | Lalshak, indian spinach, garlic, Cole crops, carrot, onion | -- | -- |
| Fruit garden | 625 | Kazipeyara, Ata sofeda, Bel pineapple, jujube kamranga, jamrul dalim | 2, 1 1, 1 2, 1 1, 1 1 | 11 |
| Banana | 225 (6×6) | Banana | 7 | 7 |
| Fuelwood | 535 (9×4) | Ipil-ipil | 34 | 34 |
| Intensive mixed garden | 1375 (6×6) | Sada koroi, sajna neem, eucalyptus gamar, kadam, babla mulberry, pitraj | 2, 2 2, 4 4, 4, 4 4, 4 | 30 |
| Hedge row planting | 2900 | Bamboo grove jackfruit, mango Mahogany, teak Tentul, Arjun kalojam, sissoo, simul | 10 5, 5 3, 6 3, 2 1, 4, 1 | 40 |
| Fruit/timber garden | 935 | Lemon, litchi, jalpai amra, jambora papaya | 15, 2, 1 1, 2 5 | 26 |
| Agroforest | 900 | Yam, Ginger turmeric, chilli, arhar | | |
| Climbing vegetables on home roof | | Bean, lao, chal kumra etc. | | |
| Pond | 875 | | | |
| Houses and it's premises | 3245 | | | |
| Total | 15000 sq. ft. | | | |

Scope of homestead Agroforestry

In Bangladesh, the total number of homestead are 16.8 millions which covers about 0.27 million hectares of land. These areas are also increasing due to construction of new houses for the ever increasing population. This is the only fixed assets for poor farmers and depends largely to meet their various family needs. Therefore, we have to meet up the lion share of food, fodder, fuel and other necessities from the homestead. Presently about 90% of the fruits, vegetables and biomass fuel requirements are meeting by homestead Agroforestry. Beside the homestead in the unique areas, where vertical utilisation of land is possible through multi-layered cropping system.

Role of women's in the homestead Agroforestry

In Bangladesh women constitute about 40% of the total population. The role is not adequately reflected in the national census and development activities because of lack of necessary information and documentation on homestead agriculture. One of the major components of homestead agriculture is the planting horticultural and forest species for food, fodder, timber, fuelwood and cash. Women's can play a vital role in this program in the following ways:

- In homestead Agroforestry, women can help to her husband to make decision on:
 - Preparing homestead design.
 - Tree species selection.
 - Vegetable species selection.
 - Appropriate tree-vegetable association.
- **Management of homestead plantation:** Management activities include protection, fertilization, irrigation, pest control, weeding and mulching properly done by women's in the homestead Agroforestry system. Above management activities women's can done in the following way-
 1. *Protection:* Different seedlings and saplings are protecting by making fences (bamboo, jute stick, pole etc.), live fencing (by katamehedi, mander, rangon etc) and bamboo gabion.
 2. *Fertilization:* By using cowdung, decomposed leaves, household wastes etc.
 3. *Irrigation:* Women have properly done this activity at the morning and evening.

4. *Pest control, weeding and mulching*: These activities women are done when necessary.
5. Pre and post harvest activities of vegetables production.
 - Seed collection, seed storage and seedling raising of different timber trees, vegetables, cereals and fruit trees women's involved largely and intensively.
 - *Marketing of tree produce and vegetables*: Some location of Bangladesh and largely tribal womens involved for selling fruits, vegetables and fuelwood produce from homestead.
 - Women's can involve actively in poultry rearing, goat farming and small scale fish farming etc.
 - Finally women's can maintain a balanced ecosystem in a home garden.

Mahbubul Alam

CST-06 Batch, Faculty of Agriculture

University of Rajshahi